POLYCHAETES OF THE GENUS *MANAYUNKIA* LEIDY (POLYCHAETA:SABELLIDAE) FROM EAST COAST OF INDIA (BAY OF BENGAL)[1]

A.L.N. Sarma[2], K.R. Raju[3] and V. Wilsanand[2]

(With eleven text-figures)

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The present communication redescribes *Manayunkia spongicola* and gives a synopsis of four undetermined species of *Manayunkia*, inhabiting flocculent soft detritus-laden coral skeletons of *Tubastraea aurea* off the Orissa coast, at a depth of 12 metres. Indication of reproduction by budding is reported. Zoogeography of the known species of *Manayunkia* and their probable migration from marine to brackish and fresh waters are discussed. The impact of aphytal biota on the distribution of benthic faunal communities is also discussed. The possible utility of *Manayunkia* in aquacultural practices is indicated.

Introduction

The genus *Manayunkia* consists of tubicolous micro-annelid sabellids, essentially known from fresh water environs like rivers, lakes of North America (Leidy 1883, Foster 1972, Holmquist 1973, Poe and Stefan 1974, Spencer 1976) and estuarine and coastal brackish waters of Western Europe (Muus 1967, Green 1968, Remane 1971, Barnes 1976). *Manayunkia* is also known from the Congo River, West Africa; Brasilian mangroves; Danube River and North Japan Sea (*vide* Hartman 1959).

From Indian Waters, so far only a single species, *M. spongicola* inhabiting tubes embedded in the sponge *Laxosuberites lacustris* and among the algae under rocks in the littoral region of Chilka lagoon was described by Southern (1921). A perusal of the published literature reveals no subsequent reporting of *Manayunkia* from the Indian aquatic (marine, brackish, fresh water) systems excepting for its being listed among the phytal fauna of Chilka lagoon by Satapathy (1985). In the present systematic studies, a large number of specimens of *Manayunkia* have been recovered from the meiofauna of the coral skeletal washings of *Tubastraea aurea* laden with fine flocculent mud at a depth of 12 metres off the coast of Gopalpur, Orissa (19° 14' to 20° 2' N; 84° 51' to 85° 2' E). They were found inhabiting delicate membranous tubes covered with flocculent mud. The specimens appear to represent a species complex of the genus and do not belong to a single species. However, a good number of specimens excellently confirmed with *M. spongicola* described from Chilka lagoon seven decades ago (Southern 1921). In view of the characters, namely the nature of the branchiae, cephalic eye spots, segmental length and the presence or absence of caudal eyes (often one or two characters only), considered for the specific determination by the earlier taxonomists, the specimens could not be satisfactorily identified with any of the known species of the genus, and could be new to science. However, since intraspecific variation (within and amongst the characters) of the members of the genus are not known, new description and erection of new species is not resorted to as identifications based on a single or two characters would invariably lead to abandonment of the species sooner or later. Further, Mayer (1971) stated "Intraspecific morphs are often far more different from each other than sibling species" (p. 81).

As such, a brief description of the rediscovered *M. spongicola* with remarks on the present finds is presented here alongwith a synopsis of the observed characters of the undetermined species at hand. The systematic and ecological importance of *Manayunkia* is also discussed.

Material and Methods

Aphytal communities of sponges (*Petprosia testudinaria, Aurora globostellata, Fasciospongia*

[1] Accepted June 1992.

[2] P.G. Dept. of Life Sciences, Regional College of Education, Bhubaneswar 751 001, Orissa.

[3] Regional Research Laboratory, Bhubaneswar, Orissa.

cavernosa, *Spongia officinalis*, *Phakellia dendyi*), skeletons of corals (*Cladangia exusta*, *Cyathelia auxillaris*, *Dendrophyllia arbuscula*, *Tubastraea aurea*) and gorgonians (*Echinogorgia complexa*, *E. reticulata*, *Gorgonella umbraculum*, *G. sanguinolenta*, *Muricella complanata*) were collected from a depth of 12 metres off the coast of Gopalpur, Orissa, employing SCUBA diving. The different aphytal colonies brought on to the board of the vessel were transferred separately to large polythene containers with 4% formalin solution and brought to the laboratory. The contents of each of the polythene containers were poured into separate polythene tubs and thoroughly washed in 4% formalin solution to dislodge the epifauna. Later, the coral skeletons and sponges were broken into small pieces and placed in petri dishes and thoroughly searched for the epibionts and endobionts under stereoscopic binocular microscope. Each of the residues left in the polythene tubs was sieved separately with 500 μ and 60 μ sieves. The residue left on the 500 μ sieve was considered for macrofauna and that on 60 μ sieve for meiofaunal studies.

Results

SYSTEMATICS

Genus **Manayunkia** Leidy, 1859

Haplobranchus Bourne, 1883; *Dybowscella* Nusbaum, 1901; *Garjaiewella* Dybowski, 1929. (*vide* Hartman 1959).

Cylindrical body; unbranched symmetrical branchial lobes; no branchial radioles with cartilagenous axis and lateral pinnules; two short clavate processes, 'the palps' or prostomial tentacles within the circle of the branchiae; a well developed entire collar; with or without the caudal eyes; dorsal thoracic setae; uncini with a long stalk; pick-axe shaped setae absent; abdominal uncini elongated and ventral capillary setae.

Type species: *Manayunkia speciosa* Leidy, 1859.

Manayunkia spongicola Southern, 1921 (Figs. 1-5)

Locality: Numerous specimens associated with the coral. *Tubastraea aurea* off the Gopalpur coast at a depth of 12 metres.

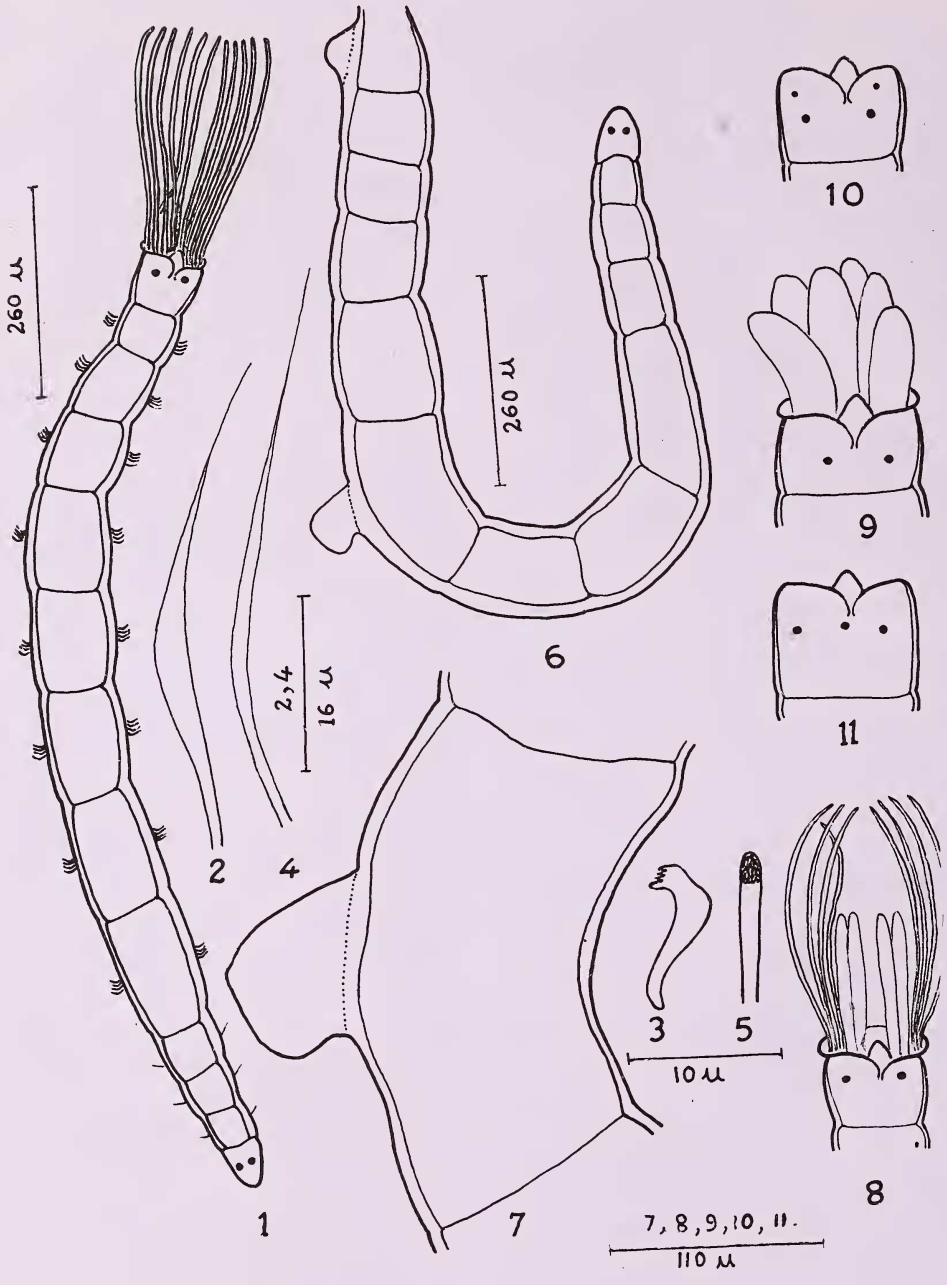
Material: In our collection in the Department of Life Sciences, Regional College of Education, Bhubaneswar.

Description: The specimens varied in length from 0.4 mm to 2 mm; branchial region measured 0.06 mm to 0.6 mm; thoracic region 0.27 mm to 1.6 mm and abdomen 0.09 to 0.25 mm. Body cylindrical. Head conical infront bearing 2 black eyes. Two short clavate palps or prostomial tentacles. A prominent well developed collar which is entire and convex ventrally. No otocysts. Thorax consists of 8 segments. The first three segments behind the collar are short and the succeeding segments gradually increase up to 8th segment, which is the largest of the body. Thoracic segments bear capillary setae with short flattened blade and long slender tips (Fig. 2). Ventral hooks stout with 3 teeth above the main fang (Fig. 3). Three abdominal neuro setae with 1-2 capillary setae (Fig. 4). Notopodia 9-11 hooks with numerous long fine teeth (Fig. 5) in several rows at one end. First and last segments of the body devoid of setae; pygidium spatulate or pear-shaped bearing 2 black eye spots. Tube membranous covered with flocculent mud. Circulatory system is well developed and whole body is coloured by the bright green chlorocruorin of the blood.

Distribution: Chilka lake; Gopalpur coast (Bay of Bengal), India.

Remarks: A large sized lateral swelling on the 5th trunk segment was noted (Figs. 6,7). This appears to be an indication that these polychaetes also reproduce by budding. Leidy (1883) observed in *M. speciosa* that the development is direct and a free swimming trochophore larva is absent. Pennak (1978) commented on the large size and lateral swellings of the 6th trunk segment of *M. speciosa* as an indication of reproduction by budding.

A brief synospsis of the distinct characters of the undetermined species is given below.



Figs. 1-11. *Manayunkia spongicola* Southern

1. Entire animal, dorsal view; 2. Thoracic capillary setae; 3. Thoracic crochet; 4. Abdominal capillary setae; 5. Abdominal crochet; 6. *M. spongicola* showing bud on 5th trunk segment and everted proboscis on cephalic region; 7. Enlarged view of 5th segment showing bud; 8. *M.* sp. showing long and short tentacles; 9. *M.* sp. showing short and blunt tentacles; 10. *M.* sp. showing 4 eye-spots on cephalic region; 11. *M.* sp. showing 3 eye-spots on cephalic region.

Manayunkia sp. 1: Typically characterised by simple, unbranched branchiae of two kinds, namely 1) short and blunt (club shaped); 2) long and slender (Fig. 8). The morphological details of head, collar, thoracic and abdominal setae and uncini and pygidium are similar to those of *M. spongicola.*

Manayunkia sp. 2: Presence of six simple, unbranched short and blunt (digitiform) branchiae is the distinguishing feature (Fig. 9). Body comprised of 13 thoracic and 3 abdominal setigerous segments. Seventh, eighth and ninth thoracic segments relatively larger than the rest of the segments. The nature of shape, size and arrangement of the thoracic and abdominal setae and uncini as in *M. spongicola.*

Manayunkia sp. 3: Characterised by 4 eye-spots on the cephalic region (Fig. 10) and 2 eye-spots on the pygidium. The morphological features of general body including head, collar, branchiae, thorax, abdomen and pygidium are similar to those of *M. spongicola.*

Manayunkia sp. 4: The distinguishing character is the presence of 3 eye-spots on the head (Fig. 11) and 2 eye-spots on the pygidium while the rest of the body morphology conforms with those of *M. spongicola.*

Discussion

Taxonomically the genera *Manayunkia* and *Fabricia* present interdigitating characters. Both the genera share the following characters: 1. The body consists of 11 setigerous segments, of which 8 are thoracic and 3 abdominal. 2. The dorsal and ventral setae on the thoracic segments are similar in shape. 3. Elongate crochets in the abdominal segments. 4. The first segment bears eyes. 5. Otocysts absent. However, *Manayunkia* differs from *Fabricia* in having a well developed collar and simple, unbranched branchiae. The genus is a rare exception among sabellids in the sense the branchial radioles are devoid of a cartilaginous axis and lateral pinnules (Day 1967). Zoogeographically, the genus appears to be well speciated and distributed in the temperate, warm temperate latitudes than in the tropical and subtropical latitudes (Table 1). *M. speciosa, M. eriensis* from the American river systems; *M. aestuarina*; *M. caspia*; *M. baltica*; *M. baicalensis* from the fresh water, coastal lagoon and estuarine locales of Europe; *M. pacifica* from Bering sea and Western Canada; *M. polaris* from North Western Russia; *M. siaukhu* from North Japan Sea; *M. africana* from Congo River; *M. brasiliensis* from mangroves of Brazil and *M. spongicola* from Chilka lagoon of India are known.

The apparent low speciation of *Manayunkia* in tropics and subtropics in general, and the Indian Ocean in particular, reflects lack of intensive faunistic searches for these interesting micro-sabellids in these locales.

Ecologically the genus is eurytopic and one of the very few euryhaline polychaete members which presumably have surmounted the physiological adjustments necessary for the marine - brackish-fresh water transition.

Green (1968) opined, considering the ability of *M. aestuarina* to tolerate low salinities (2‰), that the genus might have probably penetrated into fresh water with its representatives like *M. speciosa* known from several rivers of Philadelphia and from Great Lakes. While discussing the probability of marine origin of *Manayunkia,* it is worth quoting Remane (1971, p. 148) who stated that "High percentage of the pontocaspian relicts of marine origin have succeeded in invading fresh water, at least the lower reaches of the river, e.g. the polychaetes *Hypania invalida, Manayunkia caspia".* Lagoonal biotopes/substrates rich in detritus are stated to be congenial for the densities of *M. aestuarina* (Remane 1971, p. 165). The euryoecious nature of *Manayunkia* and the abundance of *M. aestuarina* up to 20,000 individuals per square metre was reported by Muus (1967) in his studies on the lagoons of Denmark. Of late, the occurrence of *Manayunkia* from soft detritus in a fully marine condition is also known (Barnes 1976, p. 18). The present finding from typical marine location further validates the euryoecious nature of *Manayunkia.*

In view of the predominantly soft detritus rich biotopes or substrata inhabitation of *Manayunkia*

TABLE 1
ZOOGEOGRAPHICAL DISTRIBUTION OF SPECIES OF *MANAYUNKIA*

Name of species	Locality	Author
Manayunkia aestuarina	Thames Estuary, England; estuaries of Western Europe; lagoons of Denmark.	Bourne (1883); Green (1968); Muss (1967).
M. africana	River Congo, Africa.	Monro (1939) (*vide* Hartman, 1959).
M. baicalensis	Lake Baikal; river systems of Siberia.	Nusbaum (1901) (*vide* Hartman, 1959), Green (1968).
M. baicalensis hydani	Lake Baikal.	Slastnikov (1942) (*vide* Hartman, 1959).
M. baltica	Baltic Sea.	Karling (1933) (*vide* Hartman, 1959).
M. brasiliensis	Estuarine mangroves, Brazil.	Banse (1956)
M. caspia	Caspian Sea; Black Seas.	Annenkova (1928) (*vide*, Hartman, 1959), Green (1968).
M. caspia fluviatilis	Danube River, Romania.	Bacesco (1949) (*vide* Hartman, 1959).
M. eriensis	Lake Erie, Ohio.	Krecker (1939) (*vide* Pennak, 1978).
M. pacifica	Bering Sea.	Annenkova (1934) (*vide* Hartman, 1959).
M. polaris	Bering Sea, Murman coast, Russia.	Zenkevitch (1935) (*vide* Hartman, 1959).
M. siaukhu	North Japan Sea.	Annenkova (1938) (*vide* Hartman, 1959).
M. speciosa	Schuylkill River, Philadelphia; South eastern Pennsylvania; New Jersey; Great Lakes; Alaska; Cayuga Lake, New York; California; Carolina; Georgia.	Leidy (1859); Pennak (1978); Holmquist (1973); Spencer (1976).
M. spongicola	Chilka Lake, India (embedded in sponge Laxosuberites and among algae under rocks).	Southern (1921).
	Gopalpúr, Orissa Coast (Bay of Bengal), at a depth of 12 metres.	Present authors.
M. sp. 1	Gopalpur, Orissa Coast (Bay of Bengal), at a depth of 12 metres.	Present authors.
M. sp. 2	Gopalpur, Orissa Coast (Bay of Bengal), at a depth of 12 metres.	Present authors.
M. sp. 3	Gopalpur, Orissa Coast (Bay of Bengal), at a depth of 12 metres.	Present authors.
M. sp. 4	Gopalpur, Orissa Coast (Bay of Bengal), at a depth of 12 metres.	Present authors.

in various American rivers and lakes; brackish and estuarine environs of Western Europe as indicated above, the occurrence of *M. spongicola* among the sponge *Laxosuberites lacustris* and among the algae under rocks from Chilka Lake and coral skeletons in the present study is attributed to the presence of rich soft detritus deposition on the aphytal systems.

Further, the physiognomy of the non-sedimentary biota like phytal (algal thickets) and aphytal (sessile animal growth of sponges, corals, bryozoans, gorgonians etc.) besides the quality and quantity of sediment deposited on them were reported dictating patterns of distribution and abundance of organismic communities among the benthic biota (Dahl 1948, Wieser 1952, 1959; Hagerman 1966, Sarma 1972, 1974a, 1974b, 1974c; Sarma and Ganapati 1972, 1975; Sarma and Gopalswamy 1975, Sarma and Satapathy 1978, Sarma *et al.* 1979, 1981).

By implication, the eurytopic and the euryoecious nature of the species of *Manayunkia* should render them as effective tools not only to enquire into the nature of adaptational physiology but also to conduct bio-assay studies with reference to aquatic pollutants. Their mass cultivation in laboratory conditions could also be resorted to produce protein-rich viable feed for fin fish and shell fishes in aquacultural practices. The known direct development strategy of reproduction adopted by *Manayunkia* without a free swimming trochophore larva, besides its probable ability to reproduce asexually by budding, should further enhance the potential of this micro-annelid for mass cultivation to be used as fish food. Studies aimed at determining its nutritive value would probably go a long way to render it an efficient and economic feed for cultivable prawns and fishes.

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